GAS JOURNAL, AUGUST 21, 1946

VOL. 248 98th YEAR No. 4344

THE GAS STRIKE

THE second London gas strike within the space of eight months is over, pressures are back to normal, and—we wish we could add without reservation—all is well once more. The strike—an unofficial one affecting some 2,000 employees of the Gas Light and Coke Company, and others who came out in sympathy elsewhere—arose out of a demand for an increase of 5d. an hour for certain skilled men, with proportionate increases for unskilled workers. The terms of the settlement involve an increase of 3d. an hour for boiler makers and members of the Amalgamated Engineering Union, and 2d. an hour for others, skilled or semi-skilled, including "mates" when working with skilled or semi-skilled men. The agreement also provides that the terms arrived at should be discussed at a national level at the earliest possible moment, and it has been assumed by the men concerned that the new rates, with adjustments for the provinces, would become the basis for a national agreement.

We do not know to what extent the settlement is likely to give lasting satisfaction to all parties—not least to the consumers, who ultimately have to foot the bill for all expenditure. It is sufficient to record that in a night and day of intensive negotiation, after the strike had been in progress for some days, the employers and the unions, with the assistance of the Ministry of Labour, arrived at a settlement which commended itself sufficiently to the strikers to lead them to accept it and return promptly to their duties.

All appears well—at the moment. But so long as the unofficial strike remains a "secret weapon" with which men who are not content to leave negotiations to their accredited union representatives may at any moment paralyze a huge area if not a whole Industry, just so long will an uneasy atmosphere very much like that which followed the historic Munich conversations eight years ago, prevail within the Industry and among its consumers. As *The Times* said in a leader last week:

"The incident will leave behind it the same questions that have been raised by previous unofficial strikes. Sooner or later the public will insist upon an answer to them. The unofficial strike cannot be justified. Unless trade union leaders can command the full support of their members the basis of voluntary negotiation and the smooth running of industry are destroyed. The public, which suffers most, is justifiably indignant. All this is plain and must be emphasized. Nevertheless, it is important to examine the causes of such disputes to see what way of avoiding them can be found. Men strike against the advice of their leaders while negotiations are in progress only if they feel provoked by real or imaginary grievances beyond the limits of their patience. Often their patience is quite evidently and unjustifiably too small, but the nature of their grievances still requires examination, if industrial peace is to be secured. in the present case, as in many others, the main factor seems to have been the slowness of official negotiation."

A statement issued by the Federation of Gas Employers three weeks ago says that a comprehensive agreement was submitted to the Federation in the London District towards the end of May. Claims on gas employers were concurrently put forward in other parts of the country. The employers lost no time in offering to open negotiations for a national agreement covering all districts. The National Executive Committees of the unions concerned refused national negotiations until local negotiations were completed. Accordingly the employers met the London officials of the unions and, since the claim was approximately for an additional £1 a week, the employers suggested that it should be submitted to arbitration and intimated that if any increase were awarded it would be paid retrospectively to the pay week commencing May 27. The unions decided to submit this proposal to their members and promised to inform the employers of their decision at an early date. No reply has so far been received. In a further statement issued on the day the recent strike began, the Federation said that in connexion with its offer to the unions of increased rates of pay to certain employees in the London District, the claims of labourers and mates, not subject to the wage awards of the National Joint Industrial Council for the Gas Industry, had not been rejected. These continued under consideration with the unions and any increases agreed would, as for the increases already offered to other employees, be dated back to May 27.

Again it is not for us to draw conclusions as to where there has been delay, but such delays are not uncommon. To quote *The Times* editorial again:

"Sometimes they are attributed to faulty machinery of negotiation, sometimes to delaying tactics on the part of employers who stand to gain financially by postponing wage increases, sometimes to the inability of overworked officials of great unions to give as much time as they should to every small section of their membership, sometimes in varying proportions to all three. There is great danger in a situation when workers feel they can only obtain a rapid decision by an unofficial strike. The pattern is becoming familiar. Negotiations drag on for months while men are at work. The men strike and a decision is reached in a week. There are repeated ineffectual meetings. Then the Ministry of Labour brings both sides together with the eyes of the public upon them and within twenty-four hours there is agreement. It is unfortunately only too obvious what moral dissatisfied workers tend to draw from the contrast."

The public do not always realize that, especially in the case of the Gas Industry, conversations between employers and unions do not take place between permanent officials who have nothing to do but to negotiate. So far as employers are concerned they take place between gas undertakings' representatives who are very fully occupied, and union representatives who frequently find it impossible to accommodate themselves to the dates and times that are convenient to the former. In the interests of the public and of industry, methods of negotiation require improvement and acceleration. At the same time there can be no sympathy with the "unofficial striker"—a disintegrating and, to our minds, disgusting element, a canker in any organized service, in any civilized community.

For nearly a century and a half the Gas Industry has had a fine record in the matter of relationships between workers and employers. There has been almost everywhere a sense of working "with" an undertaking rather than working "for" it, and the ties of loyalty have been based on a recognition that gas is a public utility, and that the Industry has a duty to the public which should not lightly be interrupted by any internal differences. We are glad to be able to interpolate here that the National Joint Industrial Council for the Gas Industry at an adjourned meeting on Friday considered an application made on April 24, on behalf of the gas workers governed by the Council, and finally reached agreement to increase their rates by 2d. a hour, to be paid as from April 22.

Never in the darkest days of the war was the supply of gas in the London area so extensively interrupted as it has been twice within eight months of "peace" as a result of the two strikes. The stoppage which happily came to an

end last Thursday had lasted a week and was in that sense more serious than that in November, which was confined to a week-end. During the latest strike London housewives were deprived of facilities for cooking, home laundry, and other domestic operations, thousands of works and factories were put temporarily out of action, Londoners were forced to partake of "blitz" meals, and black-out conditions reminiscent of war nights were reimposed in hundreds of miles of streets, some of them world-famed for their normal gas-lit brilliance. Before the war one of the catch lines in the Gas Light and Coke Company's advertising was "Gas Never Lets London Down." Shall we continue to pin our faith to that slogan? We do not know how long the public—notorious for its fickle memory—will foster resentment to gas as a result of these strikes or to what extent interruptions of such a serious nature will tend to weight the balance of competition in the fuel field; but from whatever angle surveyed, and whatever excuse may be offered, the unofficial striker is a menace. In saying this we care not whether such a striker is symptomatic of these unsettled and selfish post-war days.

RATING ASSESSMENTS AND E.P.T.

ALTHOUGH the war-time impost of Excess Profits Tax is due to terminate at the end of this year, it is not without interest to consider a case which came before the Kings Bench Division of the High Court recently. In Yeovil Rural District Council v. South Somerset and District Electricity Co., Ltd., the point at issue related to the ascertainment of the rating valuation of a public utility undertaking; the Assessment Committee had contended before the Somerset Quarter Sessions last year that in a valuation on the "profits basis" no deduction should be made for the amount of E.P.T. paid by the Company in respect of the year 1943, or, alternatively, that any such deduction should be restricted to that assumed to be borne by the hypothetical tenant and that account should be taken off the post-war refund of 20%. These arguments were rejected by Quarter Sessions, but a case was stated for the opinion of the High Court. The appellants sought to distinguish the decision in Port of London Authority v. Orsett Union Assessment Committee (1919)—in which Excess Profits Duty was allowed as a deduction—and argued that E.P.T. is akin to income tax assessed under Schedule D, which is not deductible in arriving at the rateable value. Payments of income tax are disallowed, however, for the reason that they are regarded as an allocation of the rent assumed for rating purposes to be payable by the tenant; the excess profits tax is not of the same nature, seeing that it could hardly be said that the mere fact of having earned profits—on which the rating valuation of public utilities is based—in excess of an arbitrary standard justified an addition to the rating burden. As to the Assessment Committee's suggestion that the post-war credit is a material item to be taken in account, it has to be remembered that the right to this refund conferred by the Finance Acts 1941 and 1942 is subject to many stringent conditions; not only is the refund declared by Section 43 of the Finance (No. 2) Act, 1945, to be assessable to income tax, but the amount thus recovered is in all other respects of a capital nature and specifically not available for ordinary revenue purposes or for distribution to shareholders.

We are pleased to note, therefore, that the Divisional Court upheld the decision of Quarter Sessions and dismissed the Rating Authority's appeal—especially seeing that the English precedent created by the P.L.A. case was subsequently approved and applied by the Scottish Court of Session in Newton-on-Ayr Gas Co., Ltd., v. Ayrshire Assessor (1923) to permit the deduction of the 1914-18 equivalent of the excess profits tax.

Personal

Mr. and Mrs. W. A. BRYAN, of Blakenhall, Wolverhampton, celebrated their golden wedding on Aug. 10. Mr. Bryan, who is on the staff of the Bilston Gas Company, has been associated with the Gas Industry for 60 years.

* * *

Mr. JOHN TERRACE, Hon. Secretary of the Institution of Gas Engineers, has returned to Dysart, Lawrie Park Crescent, Sydenham, S.E.26. His house, which was destroyed by enemy action in August, 1944, has been entirely rebuilt from ground level, and he is now very glad to be back at his old address.

* * *

Dr. D. T. A. TOWNEND, Director of the British Coal Utilization Research Association, relinquishes the Livesey Professorship at Leeds University as from Sept. 30 next, and the Livesey Advisory Committee has passed a resolution expressing its sincere regret and conveying an expression of warm appreciation of all the work done for the Department and for the Industry during his tenure of the Chair. It was in 1938 that Dr. Townend succeeded Professor J. W. Cobb. Prior to this he collaborated with the late Professor W. A. Bone, more particularly in investigating gaseous explosions at high initial pressures, on which subject he is a recognised authority. In the early part of 1945 Dr. Townend received a strong appeal to take over B.C.U.R.A. and on the advice of the Livesey Advisory Committee, the University gave him two years' leave of absence to enable him to take up the Association's Directorship.

URGENT

Those Undertakings who have not already done so are urgently requested to return the form required by the Publishers for revision of the "Calendar and Directory" for 1947.

Obituary

The death occurred at Bath on Aug. 11 of Mr. WILLIAM THOMSON-EDGAR, Chairman of the Horstmann Gear Co., Ltd., at the age of 76, after a short illness. The younger son of the late John Edgar, of Dumfries, Mr. Thomson-Edgar married Miss Pauline Horstmann, of Bath. He had been a Director of the Company since its inception in 1904. He was of a retiring disposition and only those who worked closely with him realized the value to the Company of his clear sightedness and sagacity. Mr. Thomson-Edgar was a man of wide interests. During the war he acted as Controller of Emergency Food Stores for the North Eastern Rural Districts of Bath. He was keenly interested in horticulture, and his gardens at Little Innox were frequently opened to the public in aid of charity.

* * *

Mr. ROBERT HENRY CLAYTON, a Director of the associated companies of Hardman and Holden, Ltd., and Manchester Oxide Co., Ltd., died at his home in Didsbury, Manchester, on Aug. 12 at the age of 74. Mr. Clayton had been a Director of these companies for 43 years. He received his early training at Owens College, Manchester, and after graduating in chemistry spent a considerable time in Germany before joining the Manchester Oxide Co., Ltd., over 50 years ago. Mr. Clayton became particularly interested in the dry purification of coal gas and was very widely known in the Industry both at home and abroad. His chemical training and knowledge of the process enabled him to give valuable and helpful advice on the subject. He was a member of the Institution of Gas Engineers and Coke Oven Managers' Association, also a Director of the Cortonwood Collieries Co., Ltd., and a very active member of the National Smoke Abatement Society. He was very deeply interested in the affairs of Manchester University, being a member of the Court of Governors and a past Chairman of Convocation. He was President of the Manchester Literary and Philosophical Society from 1937-39, Treasurer of this Society for many years, and was a Founder Member of the Manchester Engineers' Club.

The Minister of Fuel and Power, Mr. E. Shinwell, has accepted an invitation to open the new carbonizing plant at the Bracebridge works of the Lincoln Gas Department on Oct. 2. The City Council has decided that £15,000 shall be transferred from the Gas Department for the relief of rates.

Following representations by Middlesbrough Corporation, the Ministry of Fuel and Power has decided to allow a scheme to proceed for new carbonizing plant at Middlesbrough gas-works. The Ministry has stated, however, that there should be only three retorts instead of the five originally proposed. The cost will be over £240,000, and tenders are to be obtained soon.

A Proposal of the Ministry of Fuel and Power for the reduction in the extraction of benzole at the Market Harborough Gas Department will result in an annual loss to the undertaking of between £700 and £800. Mr. P. T. Harris, Engineer and Manager, is to interview the Ministry and press for the present benzole extraction to be continued.

Letter to the Editor

Aerated Burners of High Stability

DEAR SIR,—We have read with great interest the Paper by Mr. L. T. Minchin entitled " Aerated Burners of High Stability," published in the " JOURNAL " and congratulate the Author on his lucid exposition of a complex subject.

As we are specializing on this type of burner we hope that these few comments, based on our experience, may not be without interest:—

1. We were surprised to find that no mention is made of injectors with mixing tubes convergent internally from perimeter to throat, thus forming an " angle of approach " which subtends the incoming air stream. For self-extinguishing we have found this angle to be almost as important as the angle of injector nipple " point " shown in Fig. 6 of the Paper. In fact the two are complementary. In the case of our own product—the double injector—these angles are also very important at the second stage of inspiration.
2. Consequent on 1, injectors are now made which—although fitted with fixed injector nipples and air ports giving excellent aeration—are self-extinguishing irrespective of type and area of flame ports. Moreover, they tolerate without alteration or adjustment a very wide divergence of combustion characteristics.
3. Where per-ignition is required to take place through a lengthy tube (30 ft. or more is readily accomplished) the internal diameter of the tube should be stepped up periodically, otherwise the flame will be extinguished.
4. In his conclusion, the Author states " the flame proof head and the per-ignitable burner are mutually exclusive." We have found that this is not necessarily the case and have often been able to per-ignite forward through burner heads which are flame-proof backwards. A particular example of this is the platen heating bar—which will readily per-ignite although equipped with sawcuts only 25/1,000 wide. High aeration is essential.

A probable simple solution is that when—

S = Flame speed
V = Mixture velocity
R = Resistance to flame at ports
S − V < R whereas
S + V > R

Yours faithfully,
Aeromatic Company, Ltd.,
A. H. GREAVES,
Director.

Chandos Road, Acton, W.10.
Aug. 14, 1946.

Softening Plastics by Gas

One of the Industrial Gas Centres has evolved a simple method for softening plastic material prior to stamping. This process can be effected in several ways and the application of radiant heat by gas has already proved successful in many parts of the country. The method provides for the heating to be carried out on the surface of a specially designed hotplate since it is considered that this method is preferable, from the point of view of fuel economy, in cases where the heating of the plastic material is only carried out intermittently, continuous throughput not being required.

The hotplate was designed for a concern manufacturing spectacle frames and the plastic material in sheet form is softened prior to stamping. The operator receives it in pieces 5¾ in. by 3¾ in. by $\frac{1}{16}$ in. thick from which two frames are produced. The pieces are put on the hotplate until they reach the required degree of softness when they are placed in the pressing machine. The heating surface of the hotplate consists of a hollow plate containing special high temperature oil. The hotplate, which is hermetically sealed to prevent oxidation of the oil, is provided with a steel expansion chamber to which is attached a pressure gauge and pressure relief valve. The outlet of this valve discharges to a place of safety beneath the working bench.

The hotplate is heated by 15 neat gas jets mounted on a common float, and temperature is controlled by a rod thermostat immersed in the oil. The maximum gas rate of the burners is 45 cu.ft. per hour, and the required surface temperature of 250° F. is attained within 30 minutes from cold. When the thermostat comes into operation the required working temperature can be maintained at a gas consumption of 19 cu.ft. per hour.

It has been found that the heating of the hotplate through the medium of oil has resulted in an evenness of temperature hitherto unknown over the plate's whole surface.

A **Revised Leaflet** has been issued by J. H. Sankey & Son, Ltd., Ilford, regarding their Super acid resisting cement. It is claimed that the special features that give the cement its " Super " character are that it sets in 12 hours to porcelain-like hardness, resists all acids with the one exception of hydrofluoric, withstands temperatures up to 1,200° C., is water-resisting, has exceptional tensile strength, and can be stored any length of time without deterioration.

Nationalization

The Gas Industry's Verdict

It is announced from Gas Industry House that a full report of the ten District Meetings of the British Gas Council, held throughout the country during July to consider the proposed nationalization of the Gas Industry, will be made available at the end of this week. In the meantime the following " trailer " has been issued for publication:

The meetings were attended by the representatives of 409 company undertakings (72%) and 157 municipal undertakings (28%). The total membership of these Districts is 652 company undertakings (73%) and 238 municipal undertakings (27%).

There voted against the principle of the nationalization of the Gas Industry, 461 undertakings (81% gas sold) and for nationalization, 78 undertakings (19% gas sold). Their gas sales were 248,164 million and 57,858 million cu.ft. respectively, a total of 306,022 million.

There voted for co-operation with the Ministry of Fuel and Power, if nationalization is to be effected, 423 undertakings (92% gas sold) and against co-operation, 90 undertakings (8% gas sold). Their gas sales were 283,270 million and 23,882 million cu.ft. respectively, a total of 307,152 million.

Member undertakings are estimated to have sold 360,000 million cu.ft. of gas in 1944, being 95% of the total sales of the 680 statutory and 386 non-statutory undertakings in England, Scotland, and Wales. Expressed in terms of gas sold by member undertakings, nearly 15% did not vote on the questions of nationalization (Resolution A) and/or co-operation (Resolution B), such abstention being largely by municipal undertakings.

Additional resolutions were carried—unanimously or by substantial majorities—by the undertakings in certain Districts, urging the British Gas Council to secure the continuance and development of the Gas Industry on the basis of evolution from within; to take action as necessary for the protection of consumers, employees and owners, so as to ensure the most efficient and economic gas service possible, whether or not nationalization is forced upon the Industry; to make plans for compensation based upon the separate and individual valuation of undertakings; and/or to obtain equitable terms where the rights and interests of proprietors are concerned.

Representatives at the District meetings emphasized the urgent need of providing for the finance of capital expenditure incurred by undertakings during the interim period, in order to maintain and extend the development of the Gas Industry.

The General Manager of the British Gas Council stated at each District meeting that the Ministry clearly understood that co-operation with the Department would be entirely without prejudice to the freedom of the Council to oppose the principle of nationalization.

* * *

Electricity supply companies will not assist Mr. Shinwell to frame his Bill for the nationalization of the Industry.

This is revealed in letters, made public on July 25, which have passed between the Minister of Fuel and Power and the Companies' Associations. He acknowledges an awareness of the companies' opposition to nationalization, but, nevertheless, asks their co-operation in bringing it about. They have declined because it would be inconsistent with their conscientious belief that the country would not benefit by their destruction; that, indeed, it would suffer thereby.

* * *

Coventry City Council's Policy Advisory Committee have expressed the opinion that where nationalization of public utility services takes place it is important in the interests of democratic local government that local authorities should administer the utilities.

This important view of principle and policy was reached by the Committee in considering the possible repercussions on the Corporation's gas undertaking as the result of the projected nationalization of the Gas Industry.

They resolved: " That, while the Committee are in favour of the principle of nationalization of gas undertakings, in their opinion it is important, in order to foster a virile system of democratic local government, that the maximum use be made of the local authorities in the administration of the public utility services."

It was decided to send copies of the resolution to the Association of Municipal Corporations, the National Gas Council, and the Members of Parliament for the city.

* * *

Col. G. S. Eunson, D.L., V.D., Chairman of the Northampton Gaslight Company, in proposing the adoption of the balance sheet at the annual meeting said : " We have been under Government control for the past 90 years. Our rate of dividend is fixed, our price of coal is fixed without our having any voice in the quality, our calorific value of gas is fixed and is tested every week by an inspector of the Northampton Corporation. It is also tested for freedom from sulphur. Capital cannot be raised without permission and the amount to be raised is also fixed. So is the price of gas. What more can be done by nationalization it is hard to see. Despite many difficulties we have had a successful year."

London Gas Strike

Gas supplies were drastically reduced throughout the area of the Gas Light and Coke Company by the unofficial strike of 2,000 maintenance men and mates which began on August 7 and ended last Thursday morning. The dispute arose out of an application for increased wages, and a statement from the Federation of Gas Employers gives the following information as to the settlement that was reached:

The agreement was subject to the workers resuming work forthwith and was made in conclusive settlement of the London District negotiations.

The employers could only agree to district rates and all increases will be based thereon, but a " Better Conditions " clause will apply to undertakings.

An offer of 3d. per hour was made in respect of the following categories of workers, a list of which had been given by the workers' side late on the night of Aug. 13: Patternmakers, engine fitters, engine turners, industrial fitters, platers, riveters, welders, and holders up.

An offer of 2d. per hour was made in respect of the following categories of workers: Electricians, blacksmiths, sheet metal workers, moulders, carpenters, plumbers, chemical plumbers, coppersmiths, brass finishers, wood machinists, coachmakers, and coach painters.

The offer in respect of mates when working with the above skilled or semi-skilled men was that they should be granted the trade rate where it exists, or 2d. an hour above existing rates whichever is the higher.

These offers were made retrospective to May 27, 1946.

The Memorandum of Conditions is to be discussed on a national level at the earliest possible date.

On Aug. 9 a mass meeting of between 1,000 and 1,500 strikers, demanding increases up to 5d. an hour, rejected an offer from the Gas Light and Coke Company after union officials had advised the men to return to work. By that time, supplies had been cut by about 20%.

On Aug. 10 the Federation of Gas Employers and the two unions involved agreed to meet on Aug. 12 under the wing of the Ministry of Labour. Earlier in the day the shop stewards met to discuss the question of extending the strike beyond the works of the Gas Light and Coke Company. Further cuts were made in gas supplies, and an official of the Company said that the breakdowns which had occurred since the strike began had seriously reduced the reserves. By Aug. 12 there would be only 65,000,000 cu.ft. in stock as against the normal 105,000,000, and it would be less if there were any more breakdowns.

Street lighting, apart from essential refuge and bollard lights, was discontinued on Aug. 11 to conserve gas for cooking. The Company issued an appeal to consumers to use gas for cooking only. To ensure that the available gas should be used for that purpose, all industrial users were asked to cease using gas.

On Aug. 12 the employers and union representatives met at the Ministry of Labour, and after conversations had been in progress for several hours a statement was issued shortly after midnight in the following terms:

" Representatives of the London District of the Federation of Gas Employers and the trade unions concerned met to-day under the auspices of the Ministry of Labour to discuss the present situation in the Gas Industry in London. After full discussion in which considerable progress was made the meeting was adjourned until to-morrow morning at 10 o'clock."

A Ministry official stated that considerable progress had been made towards reaching a basis of agreement on which the union leaders could recommend the strikers to resume work, but various points still remained to be worked out. By that day gas pressures were down to between 60 and 90% of the normal, and the Company reported that there were virtually no stocks of gas and they were sending out all they could possibly make. Hospitals, restaurants, laundries, shops and houses were affected by the reduced pressures. Many restaurants were unable to serve hot meals.

On Aug. 13, not quite 24 hours after the Ministry of Labour had brought the employers and unions together for consultation, the following official statement was issued:

" Talks between representatives of the London District of the Federation of Gas Employers and the trade unions concerned were resumed at the Ministry of Labour to-day. The basis for settlement was agreed in regard to maintenance men and mates employed in London gas undertakings in membership with the Federation. The trade union representatives agreed to recommend their members to resume work forthwith."

In view of the prospect of the men returning to work on Thursday, the Company estimated that it would be two or three days before the gas supply was back at full pressure, but it was hoped that it would be all right in time for Sunday's dinner if the men returned as expected. Cafes, restaurants, and institutions continued to struggle as best they could with diminished supplies, but only those with alternative or emergency facilities were able to serve hot meals.

On Aug. 14 a crowded meeting of strikers decided by a large majority but not unanimously to accept the settlement and return to work next morning. They went back as arranged on Thursday morning, and gas pressures showed a very slight improvement by Friday morning, but it was not until the week-end that anything like normal conditions were restored.

The strike was the second in the London area within eight months. Last November the stoppage was confined to a week-end.

Patent Law Reform

The Joint Chemical Committee on Patents, consisting of representatives of the Association of British Chemical Manufacturers and other chemical organizations, has published the Memorandum of Evidence submitted by the Committee to the Board of Trade Committee on Patent Law Reform.

Part 1 of the Memorandum was submitted to the Board of Trade Committee in September, 1944, while Part 2, covering the wider aspects of the subject, was submitted in June last. It has been thought desirable, however, to print both parts as a single volume and to make them available to all who are interested. Copies are available from the Association of British Chemical Manufacturers, 166, Piccadilly, London, W.1, price 3s. post free.

The Memorandum deals in considerable detail with the reforms considered necessary in the Patent Acts, some 50 sections of which are affected.

In Part 2 there is developed a new criterion of subject-matter on the basis that every invention which is patentable must be a novel industrial application of a new discovery. Every inventor who seeks a patent must show that he has contributed some item of new knowledge to the art, and that his invention (which must be a "manner of new manufacture ") is based on that new knowledge.

Part 2 also defines " invention by selection " on the lines of the Maugham judgment as modified by 16 years of practical testing. An inventor must bring himself within the rules for " selection " if there is a prior disclosure or claim of his invention which is not merely a statement of *desiderata* but prescribes, though only in general terms, the substances, agencies or means by which his invention is effected. In these circumstances the requirements for patentability as a selection from the general disclosure or claim are (*a*) discovery of a previously unrecognized advantage shown by the selection and not common in the field of the general disclosure or claim, and (*b*) limitation to a manufacture based on that discovery. In addition there must, as usual, be novelty (the selected members must not have been specifically mentioned before), and adequate description of the invention (*i.e.*, in this case, of the advantage which justifies the selection).

The Memorandum suggests that the scope of " product claims " should be defined as protecting the product when made by the process described or by any process which is non-inventive over it. This would bring chemical inventions into line with other inventions, and if Section 38A (3) were incorporated in Section 27, Section 38A could be cancelled so far as concerns chemical inventions.

Definitions of " chemical process " and " chemical invention " are proposed. A scheme for Empire patents is outlined, but the inherent difficulties of such an arrangement are recognized.

An important modification of opposition procedure is proposed, which includes (*a*) notification of anticipations without formal opposition, (*b*) filing of an agreed " Technology of the Case," (*c*) limitation of evidence to statements of facts to the exclusion of argument, leaving the cited documents to speak for themselves, and (*d*) limited extensions of time for filing evidence. Various detailed amendments of Section 11, including the abolition of *locus standi* requirements, are suggested, and a separate Section dealing with opposition on the grounds of " obtaining " and " prior user amounting to publication " is recommended.

Freedom of amendment within the scope of the original disclosure is also suggested. Amendments which enlarge the claims (always within the scope of the original description) should be allowed subject to third party rights, a new definition of which is proposed.

So far as patent licences are concerned, Part II suggests that the sanction of an infringement action should not be available for terms and conditions which are essentially of the nature of trade agreements, and the patentee should not be allowed to assert rights which extend beyond those granted by the Letters Patent. If this principle (which is accepted by the Swan Committee) is carried into effect, the feeble provisions of Section 38 become unnecessary and a stop is put to many " abuses of monopoly."

It is necessary, however, that every assignment and licence be registered and all terms and conditions be disclosed to the Comptroller, who should have power to open them to public inspection where he finds illegal conditions imposed. This power would be a salutary deterrent against the use of patents to impose a system of private commercial law.

Part 2 recommends replacement of Section 27 by a new Section setting out the Rights and Obligations of a Patentee.

Among other proposals may be mentioned: General right of appeal from all decisions of the Comptroller; companies to be entitled to be sole applicants for patents; power for an applicant to withdraw a complete specification without abandoning the application; extension of Provisonal rights by post-dating up to six months; list of office citations to be printed at the end of specification; division of applications on initiative of applicant; printing of refused specifications with consent of applicant; general reduction of Patent Office service charges; availability of a duplicate of the Office search files for public use; revision of Section 29 wording; correspondence with patent agents to be privileged.

Extended proposals concerning third party rights have been included in a supplement. A number of the recommendations put forward have already been adopted, and are included in the Second Interim Report of the Departmental Committee (Cmd. 6789).

German Domestic Gas Appliance Industry

There has just been published by H.M. Stationery Office Final Report No. 588 of the British Intelligence Objectives Sub-Committee. This report (4s. net) deals with the German domestic gas appliance industry. The team appointed to conduct this investigation on behalf of the Ministry of Fuel and Power, in co-operation with the Society of British Gas Industries, consisted of Mr. R. J. Gregg, Sales Manager, Ascot Gas Water Heaters, Ltd., Mr. J. H. Ewart, Ewart & Sons, Ltd., and Mr. F. Brinsley, Radiation, Ltd. The team was given every assistance by Mr. M. W. Burt, Manager and Secretary of the Society of British Gas Industries, and before departure a complete plan of operations was formulated. The party left the country early in February, having been finally briefed by Mr. A. R. M. Murray, of the Ministry of Fuel and Power. A rapid journey was made by Dakota plane from Croydon to Buckeburg and liaison was first estblished at Bad Oyenhausen, where further briefing was given by Officers of the Control Commission. The whole of that part of northern Germany was under heavy flood at the time and travelling was extremely difficult —in certain instances quite impossible. Constant detours had to be made and the billets occupied were badly flooded and amphibious jeeps had to be used to evacuate investigators.

To obtain a reliable cross-section of the German gas appliance industry within the limited space of three weeks every contact was carefully planned and time factors established, although as it transpired it became necessary to spend considerably more time at various places than was first anticipated. A Humber " Battle Waggon " was placed at the disposal of the team complete with driver, and long and arduous journeys were made daily.

Some 6,000 miles were covered through floods and heavy snowfalls. The main tour was from Hanover, calling at Osnabruck *en route*, and thence down to the Ruhr district, where the major proportion of the investigation work was carried out, proceeding from there down the Rhine Valley to Coblenz and to Frankfurt, where official transfer from the English zone to the American was arranged. The journey continued to Karlsruhe, terminating at Stuttgart, the return journey being made via Frankfurt.

Mr. Gregg was responsible for the organization of the tour. Investigations with German executives were conducted on reasonable lines for the most part, Mr. Ewart and Mr. Brinsley interrogating on the technical side while Mr. Gregg undertook sales and commercial examination. During each investigation individual members of the party made specific notes which were compared each evening, and the final report agreed upon and transcribed on the spot. A quantity of appliance literature and drawings were requisitioned and a number of gas appliances were listed for removal to England

The official report provides a full index of subjects covered, complete list of literature and drawings obtained, and a specification of appliances requisitioned. Access to drawings and literature is being arranged, and when the appliances arrive in this country the necessary steps will be taken to place them at the disposal of all those interested.

Exhibition Within an Exhibition

Mr. Lewis Silkin, Minister of Town and Country Planning, will open the *Yorkshire Evening News* " Homes of To-morrow " Exhibition in Messrs. Lewis's Store, Leeds, on Aug. 30.

One of the principal features of this exhibition will be the British Gas Council's Home Planning Exhibition sponsored by the Yorkshire West Riding District of the B.G.C. The whole of the Yorkshire W.R. gas undertakings are behind the project, which is designed to bring gas and gas appliances before Yorkshire housewives, in the most modern and up-to-date home and kitchen settings.

The gas undertakings in Yorkshire are staffing the exhibition.

The Ministry of Fuel and Power has authorised an increase in the price of gas by an amount not exceeding 10d. per 1,000 cu.ft. by Sanquhar Town Council.. The Council had asked for authority to raise the price by 10d., and the new charge will take effect after the September meter reading, when the cost will be 7s. 1d. per 1,000 cu.ft.

The Metronic Instrument Co., Ltd., have issued an attractive leaflet describing their range of flow indicators and recorders. Flow measurement of water, steam, and high-pressure gases is effected with instruments in which the movement of the U-tube float is transmitted to the indicator mechanism through the Metronic magnetic transmission. This transmission unit is in two parts—one magnet being connected to the float and enclosed inside the U-tube limb. The position normally occupied by the float spindle in a differential pressure movement is blanked off with a heavy flange, and a second magnetic unit is located outside the flange. By this means the slightest differential pressure is transmitted irrespective of the static pressure of the flowing fluid. The pen gear on Metronic circular chart recorders is mounted on a unique swivel arm which enables the pen arm to swing 5 in. away from the chart during chart changing, maintaining the pen in a horizontal position. The pen gear is fitted with the usual micrometer adjustments for pen pressure and pen zero. Illustrations of circulator dial, cabinet and standardized indicators are included.

Cheaper Gas at Coventry

Coventry City Council has approved the recommendation of the Gas Committee, whereby, as from Oct. 1, all existing out-district surcharges on gas will be abolished and the schedules of gas charges for both domestic and non-domestic purposes will be uniform throughout the area of supply. The reduction varies from 5.4d. to 11.7d. per 1,000 cu.ft., and the areas effected are Bedworth Urban, Kenilworth Urban, and portions of the parishes of Allesley, Berkswell, Keresley, Binley, Brandon, Bulkington, Ryton-on-Dunsmore, Baginton and Stoneleigh within the gas undertaking's statutory area of supply.

This latest reduction in gas charges in addition to the reduction to non-domestic consumers which came into effect from April 1 means an annual saving to gas consumers of some £80 000.

Women's Gas Council

The Southend-on-Sea branch of the Women's Gas Council has been very active since its formation ten years ago. During the war evacuation hit the branch hard, reducing its 700 membership to a mere handful, who stayed on to keep it going. Turning their attention to war-time needs, members met in the Club Room at the Southend works of the Gas Light and Coke Company to knit comforts for the Royal Navy. They entirely stocked the two destroyers *Escort* and *Jervis*, and re-stocked *Jervis* after an accident in which she lost practically everything. They also knitted hundreds of comforts for men in minesweepers.

The August issue of the Gas Light and Coke Company's *Co-Partners' Magazine* states that membership of the branch is now well over 400, with Mrs. Stephen Hay as Chairman. Classes in leather work and make-do-and-mend are being held in new premises. Cooking demonstrations are given by Miss Fisher, the Company's demonstrator, and it is hoped to hold practical cooking classes in the new year.

Rawmarsh Gas-Works Visit

The first of a series of visits arranged by the Rawmarsh Urban District Council for the general interest and education of both adult and youth organizations in the district was paid to the gas-works on Aug. 8. Mr. V. J. J. Siddons, Engineer and Manager, had prepared a seven-page resume of the local and national history of the Gas Industry, a copy of which, together with the British Gas Council's publication, " The Treasure of Coal," was handed to each visitor at the beginning of the tour.

Mr. Siddons conducted the tour and explained the functions of each section of the plant, and described the improvements and developments that had taken place since he had been in charge of the undertaking. He also indicated further developments which had been planned for the future.

The visit occupied some three hours, and at the close Mr. Siddons was complimented on the prosperity of the undertaking. In response, he paid tribute to the support he had received from everyone engaged in the Department.

Fuels and Combustion Courses

The Northampton Polytechnic, St. John Street, London, E.C.1, has issued its syllabus of part-time (day and evening) courses in Applied Chemistry for the 1946-47 session. The programme includes two special courses of weekly lectures on Fuels and Combustion, one, commencing on Oct. 8, covering Combustion and Furnace Practice, and the other, starting on Oct. 10, dealing with the Occurrence, Production, and Properties of Solid Fuels.

The former course is in four sections. Mr. J. E. Law will give ten lectures on the Principles of Combustion and their Relation to Furnace Design, and ten on Furnace Practice. Mr. S. C. Fox will deal in eight lectures with Steam Raising in Boilers for Process Work and Heating, and Mr. C. J. Hasler will give two lectures on Water Conditioning and Control.

The series commencing on Oct. 10 will cover the following subjects: The Origin, Distribution, and Constitution of Solid Fuels (lecturers, Dr. L. Horton and R. B. Randall); The Preparation of Coal for the Market (Dr. E. T. Wilkins); The Behaviour of Coal on Heating, and Bulk Storage (Dr. H. E. Newall); Carbonization of Coal—(*a*) Gas-works Practice, (*b*) Coke Oven Practice (H. Bardgett); Carbonization of Coal, (*c*) Low Temperature Carbonization (D. MacDougal); By-products of Coal Carbonization (Dr. C. M. Crawley); Coal and Coke for Industrial Furnaces and Producers (A. Fitton); Coal and Coke for Domestic Furnaces (R. H. Rowse); Hydrogenation (C. A. Cawley); The Fischer-Tropsch Process (Dr. S. R. Craxford); The Occurrence, Winning, Harvesting, and Treatment of Peat (D. MacDougal); Methods of Analysis of Solid Fuels (L. J. Edgcombe).

Enrolment week is from Sept. 16 to 20. Further particulars of the courses may be obtained from Dr. J. E. Garside, Acting Head of the Department of Applied Chemistry.

Convection Drying of Paint

Although attention has been focussed lately upon methods of drying paint which involve the use of " infra-red " or " radiant heating "—for which gas is now acknowledged to be highly suitable—this method cannot be applied to all paints with equal success. Paints which dry by evaporation, or by evaporation followed by oxidation, are generally best dried by convection heating. Paints which require polymerization as well as evaporation of the solvent are best fitted for drying by radiant heat.

An example of the convection method is provided by an experience which occurred when the Ministry of Supply required steel mattresses for the invasion of the Continent to be made urgently to replace an existing design which had proved unsuitable. The steel mattresses were riveted together in wooden frames and were then coated with a protective paint. That was all plain sailing, a straight production job. The real problem was to dry the paint by a precision stoving technique which should give full protection. All the information available about the characteristics of the paint was that it was highly inflammable and that the maximum stoving temperature must not exceed 400° F. The nearest Industrial Gas Centre was approached for advice.

One of the firms who undertook the manufacture of these mattresses investigated existing methods of drying by radiant heat, &c., and decided to experiment in other directions as they were not entirely satisfied with the results obtained. The Industrial Gas Centre recommended the use of a re-circulated atmosphere type of oven on the ground that it had a wide range of application and was capable of close temperature control with much greater uniformity of temperature throughout the oven.

The mattresses were 11 ft. by 6 ft. in area. The final design of oven permitted four of these mattresses to be treated at one time and comprised the stoving oven proper, with internal dimensions of 12 ft. long by 18 ft. wide by 7 ft. 6 in. high, an independent combustion chamber, and a recirculating fan. The main frame of the oven structure was made of 3 in. channel sections, heavily braced for rigidity, double cased, and lined with 3 in. of slag wool insulation, with hinged insulated doors at each end, arranged to accommodate an overhead suspension rail from which the mattresses were suspended and moved in cycle from the dipping tank, through the stove, to the despatch department. Three exhaust ducts, with butterfly dampers, were arranged in the top of the oven, with a hinged explosion flap above each door.

Gas was burnt in a seaparte combustion chamber lined with refractory insulating brick with internal baffle walls 4½ in. thick to prevent the flame from travelling into the drying chamber proper. Four gas burners fired directly into ports in the first of these baffle walls, secondary air being admitted into this portion of the combustion chamber through suitably screened side ports. These burners were thermostatically controlled, thus ensuring very accurate temperature regulation. Arrangements were made to ensure that all gas, except the independent full-pressure pilot jets, could be cut off if the circulating fan motor circuit should be broken.

A circulating fan picked up part of the outlet gases drawn from the top of the oven; it also drew in air from the shop through a dampered inlet on the return duct, and the full amount of hot gases from the combustion chamber. The mixture of air and hot flue gases from these three sources was then forced from below into the drying chamber through a perforated plate running its full length. The perforations were so designed as to distribute the flow of hot gases uniformly throughout the length of the oven. After travelling upwards through the oven the gases passed through a similar perforated plate and were then collected in an insulated return duct. By adjustment of the butterfly dampers on the air intake, and the three exhaust ducts, the atmosphere within the oven could be balanced or varied to meet any desired requirements.

During the whole of its production period this oven proved to be most satisfactory in operation, and produced a perfect stoved finish on the mattresses. When working at a maximum oven temperature of 340° F., with a loading of two mattresses each weighing 180 lb., the cycle of operations was 15 min. per load. After a little experience, it was found that a perfect finish could be obtained when working at a temperature of 300° F. The maximum gas rate was 600 cu.ft. per hour, and the gas consumed per treated mattress over the total period of production was 72 cu.ft.

The success of this recirculation system has prompted other firms to enquire for similar plant. One of these enquirers wishes to dry 10,000 sheets a day of expanded metal measuring 9 ft. by 2 ft. which have been dipped into a tank of protective paint. The system clearly has wide applications.

" The Younger the Better" would seem to be the motto of the Sheffield and District Gas Company when they invited a party of village schoolchildren from Great Massingham, Norfolk, some of whom had never before left their village, to the Neepsend works of the Company. Following their tour of the works they were entertained to tea, and on their departure each child was presented with an envelope containing a selection of suitable British Gas Council literature, including " The Treasure in Coal," " About the Home," " Kitchen Planning " and the novelty " A Model of a Gas Works."

More Demonstration Houses

To demonstrate to the nation that the builder is the best judge of the type of house wanted by the public, the House Building Industries Standing Committee organized last year a national competition in which builders from all parts of the country participated. From plans approved by three adjudicating area committees (including architects, builders and housewives) and finally selected by a Central Committee, 27 demonstration pairs of houses are being built in a number of different areas. Already several pairs have been completed and opened for inspection and criticism by the public, and three more pairs have been opened in the past few days at Headington (Oxford), St. Budeaux (Plymouth), and Orpington (Kent).

All the houses have been designed with special regard to local conditions, and consequently the plans show a wide variation of constructional work, interior planning, and elevation. The houses, which are being built in co-operation with the Ministries of Works and Health, are being used as centres of research to establish the cost of man site hours and material needed in the construction of the new type, well built and well equipped permanent small house. It is impossible at present to make any definite statement on the price of the new houses if erected in numbers. In many cases the builder is not only dealing with new materials, but prototypes of new equipment are being installed. The statistics now being obtained must be carefully analyzed before any announcement on cost can be made, but it is hoped that a full report will be published in the autumn.

The houses at Headington, designed by Mr. L. G. Norcott and built by Messrs. J. A. Pye, Ltd., are brick built, the brickwork above first floor level being rendered with cream coloured cement and sand with stippled finish. The houses are tiled and the windows are wooden casement with top hung fanlights. Service meters and storage are enclosed in a cupboard beneath the stairs. In planning the ground floor rooms the architect has taken into consideration the needs of the family as well as the young married couple. There is a separate living room and dining room, divided by folding doors, permitting the privacy needed for school age members of the family.

The influence of women's organizations on the designing of the smaller type house is shown in the arrangements for a plentiful supply of hot water, the extensive cupboard accommodation, and the excellent planning to allow plenty of light and air within the house.

The kitchen in both houses has been planned and fitted to save labour and opens through a swing door on the dining room. The appliances demonstrate the great advance in the standard of living for families in the lower income group. Constant flow ventilators, an outcome of wartime research into ventilation, are fitted in all rooms not having a fireplace. All plumbing, pipes, cylinders, and boilers are of copper and are frost-protected. The dining room open fire is of the 24-hour burning type and supplies warm air to two bedrooms. A solid fuel independent boiler heats the domestic water supply.

Planned by Mr. K. A. Barter and built by Davis Estates, Ltd., the pairs of houses at St. Budeaux and Orpington are brick built with tiled roofs and have standard wooden casement windows and french doors leading on to a tiled terrace. The cycle and tool shed, fuel store, and recess for the dustbin form part of the house. Alternative interior planning is demonstrated. In one of each pair of houses the dining room is separate from the kitchen, and in the other there is a dining room with a utility room which contains the cooking stove, washing machine, and drying cupboard.

The convector type fire in the living room is placed centrally in the house and is not only 24-hour burning but provides heat through ducts to two bedrooms and the linen cupboard. All the plumbing is insulated, and the pipes and covering porches are in lead. Additional insulation value is given by the specially designed roof which has a steel framed truss supporting insulating slabs.

Training for the Coking Industry

In pursuance of the policy of the Coke Oven Managers' Association to take active interest in the technical training of personnel for the Coking Industry, the General Council of the Association has instituted a scheme for the temporary interchange of staff, such as chemists, foremen, trainees, &c., to enable them to obtain experience of operating technique at plants other than those at which they are normally employed.

Many companies operating coke oven plants associated with iron and steel production, chemical manufacture and town gas have indicated their willingness to offer encouragement and facilities to make the scheme a success, so that their employees will realize that a very live interest is being taken in their advanced training and insight into technical problems, differing from those which they meet from day to day in normal employment.

A small committee has been formed to organize the scheme under the chairmanship of Mr. C. P. Finn, M.Sc., F.R.I.C., and further information can be obtained on application to the Committee Secretary, Mr. G. W. Chambers, Ellerslie, Netherwood Road, Wombwell, nr. Barnsley.

The Gas Industry in Norway: 1939-1945*

By JOHN IRMINGER

General Manager and Chief Engineer, Gas-Works, Bergen

At the time of the outbreak of the Hitler war, the gas-works of Norway were generally well supplied with coal and spare parts. In the period from September, 1939, until Norway was attacked on April 9, 1940, stocks were further replenished by supplies from the United States of America.

During the early weeks of fighting only two gas-works, Kristiansund and Aalesund, suffered damage, German warplanes dropping high-explosive and incendiary bombs on these undefended towns. When the fire brigades and the population turned out to extinguish the fires, German warplanes again appeared, and used machine-guns against the unarmed civilians. In Kristiansund particularly the gas-works suffered severely, and gas production was stopped from April 28 to June 8, 1940. The town lost 770 houses and 650 gas installations through fire. Two gasholders were pierced in numerous places by machine-gun bullets and by bomb splinters. The escaping gas took fire, but this was extinguished when the holes in the sides reached water level. No explosion occurred.

At Aalesund the gas-works was stopped for one day only, the damage not being so serious.

At Trondheim the Germans put up submarine workshops close to the gas-works, which suffered severely when the submarine station was bombed on July 24, 1943. The gasholder and a number of buildings were completely wrecked, but the retort settings and the plant, with the exception of the purifiers, suffered surprisingly little damage. Gas making was recommenced on Mar. 11, 1944, when gas was again supplied to the town, without the aid of the gasholder, the make being sent direct into the mains. The management tried to keep as regular a gas pressure as possible by varying the amount of gas used for heating the settings.

The gas-works at Bergen had one three-lift holder destroyed in April, 1944, when a German ammunition ship blew up a mile away. The outer lifts were damaged beyond repair, while the inner lift rested in the water tank, sealed all round and practically undamaged. The remaining gas in the inner lift was displaced by water-cooled waste gases from the settings, and the waste gases were again displaced by air, making it safe for workmen to work in the damaged holder. The outer lifts were removed, and the holder was again put to work with only the top lift working.

From time to time, gas mains, generally of smaller dimensions, were destroyed by bombs or shells; but all such damage was quickly repaired with surprising ease, the mains very seldom catching fire, as they were generally jammed with soil or filled with water.

Rationing

During the first few months of the war the various gas-works had to rely upon stocks in hand, but after some time the Germans commenced supplying coal to the gas-works, which were ordered to decrease coal consumption to a certain percentage of the normal. This percentage varied in different towns, and at different times from 50 to 70% of normal consumption.

Consequently it became necessary for the various gas committees to introduce some form of rationing, and this was very often carried out by shutting off gas to consumers who had other means of heating, especially electricity, or by reducing the permitted ration to a certain percentage of normal consumption. Industrial plants, and particularly plants for food production, were generally permitted to consume the necessary quantity of gas. German installations, such as hospitals and military establishments, appeared as new customers, and in some cases used up to 20% of the total gas consumption.

Towards the end of 1944, it became evident that the Germans were reaching the end of their tether; coal supplies to gas-works ran very short, and round about Christmas, 1944, the gas-works of Norway, with the exception of a few small works, were notified that no more coals were available, and that they would have to stop all gas production in the New Year. This naturally caused panic amongst customers, who frantically bought electrical cookers, generation of electricity not being influenced by the shortage of coal, but depending upon water power.

"Closing Hours"

Gas-works managers, who expected that the war might finish early in 1945, generally tried to put off the time of complete stoppage of the works, in order to help the large number of customers who could not obtain electrical installations in time. Most gas-works introduced a system of supplying gas during certain hours of the day (*e.g.*, for two hours in the morning, two hours at mid-day, and two hours in the afternoon), while only ½ or 1 in. of pressure was kept in the mains during the remainder of the 24 hours. It was found, however, that even during the hours with such a low pressure in the mains, consumers in the higher parts of towns could use gas, and the reduction in consumption was highly unsatisfactory. Many works gradually reduced pressure during "closing hours" to zero at the governors of the works, even running the risk of drawing air into the mains; which actually took place, fortunately without disastrous consequences. It is interesting to note that such a risk, which no responsible gas engineer would have dared to take in normal times, became an everyday occurrence.

As far as can be ascertained, only one minor accident occurred, when some gas meters exploded in the lower part of the town, in a German institution which had attempted to use gas during "closing hours." As a result, air was drawn into the meters, which exploded when gas pressure was restored during "cooking" hours. Towards the end, gas was supplied for two hours only every day, and finally, some time before V-day, the gas supply was stopped altogether.

From the time rationing became necessary, the calorific value was reduced, generally about 20%, the reduction taking place in steps to allow sufficient time for adjusting consumers' appliances.

Competition of Electricity

After V-day the gas-works of Norway were ready to start gas making, but it took a long time before the authorities found their way clear to granting the necessary coal, and during this time electricity enthusiasts were extremely busy preaching that gas-works were superfluous and should never be permitted to restart. However, the works did start gas making in August, 1945, and consumption has increased steadily, until it has now reached about 75% of normal. Gas-works have lost a considerable number of consumers, who were forced, by the stoppage, to install electrical equipment, but to-day there are many enquiries for new gas cookers. Prevailing trade restrictions unfortunately prevent or delay the necessary importation of equipment. These restrictions and the bureaucratic methods involved, cause unnecessary delay and hamper the work of bringing consumption up to the normal level.

Makers of electricity plant have been very busy advocating the building of super power stations able to take over the whole of the heating and cooking loads in all the towns of Norway, and these people have published statements and figures which bear no relation to a sound economic policy. Many of these statements have been gainsaid even from responsible electrical quarters. This propaganda is calming down somewhat, as responsible people begin to realize that it would be unwise to add to the enormous expenses of the war, by building new super power stations, when the demand for heat can be fully covered in a more efficient and economic manner by gas and other fuels. In the discussions regarding heat supply by electricity, some technicians based their calculations upon comparison with the present high prices for coal, prices which include the present high freights; while others, for the sake of comparison, calculate with prices somewhat higher than pre-war levels.

The Future

Future development of the Gas Industry in Norway will depend to a large extent upon the price of coal. There can be no doubt that if that can be brought down to a reasonable level, the Gas Industry in Norway should have every chance of a normal sound development until such time as atomic or other energies may be introduced, and which may produce cheaper heat. If, however, coal prices should be kept at their present high level for any considerable period, then electricity may become a far more serious competitor than in pre-war days. The need for sound judgment and clear vision ahead is greater than ever to-day, in order that the community may be supplied, in an efficient manner, with the cheapest possible heat and power.

*From "The Gas Industry Overseas, 1939-45." Communication No. 299 of the Institution of Gas Engineers.

Royal Charter for Institute of Fuel

The Council of the Institute of Fuel has received a letter from His Majesty's Privy Council Office in the following terms:—

"I am directed by the Lord President of the Council to inform you that the King was pleased at the Council held by His Majesty on July 10 to approve the grant of a Charter to the Institute of Fuel. The Order in Council approving the draft Charter will be issued to the Home Office, from which Department you will receive a communication in due course."

Although the Council is not yet aware of the date at which the Royal Charter will become operative, it places on record its thanks to all those, particularly Sir John Greenly, Mr. H. A. Humphrey, and the other members of the original Charter Committee, as well as fellow-members of the present Committee, including Dr. G. E. Foxwell, as Charter Secretary, who, by their continued interest and devoted efforts, have been instrumental in securing the grant which has now been approved.

The Preparation of Coke*

By P. C. GARDINER, F.R.I.C., M.I.Chem.E.,
Chief Chemist, Tottenham and District Gas Company

THE gas engineer gives attention to the preparation of the coke he makes with the object of increasing its usefulness, thus widening the sphere of its utilization. The rapid expansion of the sale of coke for domestic water heating and for open fires within recent years has demonstrated the effectiveness of the efforts so far made, and there is reason to believe that this expansion is yet far from its peak. Indeed, at the present time, the great hindrance is lack of tonnage. Although there are many methods available for preparation of coke for the market, the selection of the scheme most suitable for any particular works is often a matter of great difficulty on account of the limitations of existing plant or other conditions. It is, therefore, proposed to review the factors, often of a conflicting nature, which should be taken into consideration. In doing this, nothing new is put forward, but an attempt is made to bring known facts into their proper perspective.

The beneficial effect of carbonizing Derbyshire coals in continuous vertical retorts from the point of view of domestic coke production, was recognized many years ago by Col. H. C. Smith, then Chief Engineer to the Tottenham and District Gas Company, and he initiated the policy which has been pursued by the Company for the past 20 years with success. In setting out a practical scheme for the preparation of coke, several difficult questions have to be decided or, at least, their relative importance gauged. Before it can be judged to be satisfactory, the coke must be prepared in such a way that, eventually, it complies with some definite requirements. Until this standard is defined much more closely than at present, the position must remain uncertain. The quality of the raw material available and the type of plant in use at the gas-works are the determining local factors, and it is often possible only to make the best of a bad job, owing to the very limited scope afforded. However, objectives should be set and, for reasons referred to later, definite properties should be aimed at, in the coke produced, which render it acceptable for use in open fires. This, in itself, raises a difficult question—*viz.*, the extent to which the standard should be dependent on the use of specially designed coke-burning grates.

The performance of a number of grades of coke, although satisfactory in specially constructed appliances, is very poor indeed in the ordinary grates installed (usually for coal) in small houses. Coal-burning grates will still be in an overwhelming majority for many years to come, and although the provision of specially controllable fuel-burning appliances should not be discouraged, it is my opinion that it should be the aim of the carbonizer to produce coke which will give a satisfactory performance both in respect to ignition and rate of burning in the simplest style of grate, or, for that matter, without a grate at all. In support, the Author would remind members of the late Prof. Boys' view on this point. The heating of living-rooms is a major post-war problem throughout the country, and, for years, the only practical substitute for the millions of tons of raw coal now used for this purpose will be a smokeless fuel which will burn in existing coal grates.

Coke suitable for open fires will become very important, and it must be a better policy to aim at producing a coke which will ensure an acceptable fire in any type of grate, rather than to depend on the provision of special grates which are not only costly but which must take many years to install in any large number. No coke which requires a special appliance for its use should be regarded as completely satisfactory. So important is this that, in the Author's opinion, artificial activation is essential in the cases of all dense cokes.

PRELIMINARY CONSIDERATIONS

Ideal Coke

In addition to endeavouring to exercise some selection in coal and in carbonization plant, the gas engineer's duty is to produce a coke with properties as near to the ideal as the economics of his works allow. In order to set a standard (rarely, if ever, attained), the following figures are given :—

TABLE 1

Moisture %	Ash %	Bulk Density lb. per cu.ft.
4	4	21

For industrial purposes the bulk density might with advantage be up to 30 lb. per cu.ft. The object of systematic preparation of coke is to produce a fuel at the gas-works conforming as nearly as is practicable with the above ash and moisture contents and to such other standards of density, sizing, &c., as are required by the markets in view.

* From Communication No. 295 of the Institution of Gas Engineers.

Open Fire Coke

In view of the importance attached to open fires and to the immense future for a thoroughly satisfactory smokeless fuel for this purpose, quality of coke should be judged largely by its free-burning capabilities. Coke quite satisfactory for this purpose can be produced at gas-works, provided it is possible to take advantage of all the recommendations which follow.

Moreover, there is an enormous potential market for such a coke at a remunerative price. The overwhelming possibilities of this market are not generally appreciated, but it should be remembered that 49 mill. tons of raw coal are burnt in this country annually by domestic consumers, largely for heating; whereas only some 4 mill. tons of coke are used for similar purposes. The national importance of substituting coke for raw coal, both from the fuel economy standpoint and that of smoke abatement, may not require emphasizing here, but it is a matter which does not receive sufficient recognition in official quarters, and one which cannot be overstressed at the present time.

Bulk Density

The following Table gives the bulk densities of different cokes produced at Tottenham, and special attention is drawn to the characteristics of the cokes from the same class of coal in the two different types of carbonizing plant.

TABLE 2

		Lb. per cu.ft. (7.5% water)	Cu.ft. per ton (7.5% water)
Intermittent Chambers.			
S. Yorkshire Coke...	Grade I	28.5	78.3
	Grade II	29.5	76.0
Durham Coke	Grade I	33.3	67.5
	Grade II	30.2	74.1
Continuous Vertical Retorts.			
S. Yorkshire (and Derbyshire) Coke	Grade I	23.3	96.1
	Grade II	24.3	92.2
	Grade III	24.1	92.9

This Table brings out very clearly the advantage to coke quality of carbonizing a low-rank coal in continuous vertical retorts. If the works is so fortunately situated as to be in a position to produce both high and low bulk density cokes, efforts should certainly be made to keep the two varieties separate in order to market them for the duties to which each is respectively suited.

General Requirements

There is little difficulty in producing from any of our normal gas-making coals a coke reasonably suitable for industrial purposes; simple screening is usually all that is necessary. The only exception is in the case of soft, low-rank coals, which give a coke which burns away too rapidly in forced-draught boilers. On the other hand, the production of an acceptable domestic fuel necessitates the selection of coals and carbonizing plant as well as careful sizing. However, the quality of fuel suited to domestic fires and water heaters is also readily acceptable for most industrial purposes, provided it is suitably sized, although there are exceptions. The success or otherwise of any scheme of preparation of the coke is, therefore, to be judged largely by its effectiveness in producing a free-burning coke. In order to achieve success in this direction, a variety of factors have to be taken into account. These come under the following headings:—

(1) Origin of coal.
(2) Degree of preparation of coal.
(3) Type of carbonizing plant.
(4) Method of coke quenching.
(5) Type of coke handling and grading plant.

It is, of course, obvious that in any particular works, certain of the items are fixed and cannot be changed. Hence, in practically all cases, the type of coke available for sale is the result of a compromise among these factors. Furthermore, the combined costs of gas making and coke production will have to be set against the combined revenue from gas and coke, to arrive at yet another compromise. It is important, therefore, to decide whether coke is to be completely subordinated to gas production or whether a two-fuel market is to be sought and exploited.

COAL QUALITY

Origin of Coal

The characteristic which largely controls the burning of coke is its pore formation, and this is a function of the rank of the coal from which it is produced. Experience shows that the coals most commonly used for carbonizing in gas-works, range themselves roughly in ascending order of merit, so far as the quality of the coke for domestic purposes is concerned, as the area of their origin

moves southward from Durham. Thus, the superior gas-making coal from Durham, which is often unscreened, produces a coke which, although very good boiler fuel, cannot be classed as free burning. It is, consequently, not really suited to open fires, although a great deal of it is used for that purpose.

As the point of origin moves southward to South Yorkshire the suitability of the coke for open fires increases; and the coals from Nottinghamshire and Derbyshire are even better as raw materials from which to produce free-burning cokes. On the other hand, such coals from Nottinghamshire do not usually commend themselves as good gas-making coals. This is on account of their relatively high oxygen content and ability to hold a high proportion of hygroscopic moisture. It is, therefore, seen that the coals from the larger bituminous fields in England increase in gas-making value as the area in which they are mined moves northward; whereas, as far as coke quality is concerned, there is a very definite improvement in a southward direction. From the very start it must be recognized that the whole business of selecting coals for use in gas-works is a matter of compromise. The assessment of their combined value must of necessity be a series of compromises depending not only on the grade of coal, but also on the type of carbonizing plant available.

Ash Content of Coal

Next in order of importance is ash content, in respect of both its nature and quantity. No method of preparing coke can possibly ensure a really acceptable smokeless fuel from the carbonization of a coal containing a high proportion of ash. In any case, the proportion of the coke is 50% higher than the ash in the coal. In this connexion we are dependent upon the colliery taking the first and essential step in the production of good coke. The extent to which cleaning is possible is indicated by the following results of tests carried out in 1930 on a South Yorkshire slack having the following proximate analyses before and after cleaning:—

TABLE 3

Description of Coal	Volatile Matter %	Ash %
Original ...	33.3	8.0
Cleaned ...	35.8	1.7

Coal Cleaning

The first effort in coke preparation should be to produce coke having a low ash content by carbonizing a low-ash coal. This can be secured by treatment at the colliery, where, there is every reason to expect, it should be done. Some washing is now generally adopted, but not in all cases are results satisfactory. Although the ash in small coal can be reduced until only the inherent ash remains, this is not necessarily to be commended; but washing to a greater extent than at present practised is essential to good coke production.

Some years ago, Dr. R. Lessing advocated a process for cleaning coal, the results of which were so encouraging that a test on a full works scale was carried out under the supervision of the Tottenham and District Gas Company. A train-load of South Yorkshire slack was cleaned by his process which consisted of first dedusting the coal and then subjecting it to a flotation process with liquor of specific gravity of 1.4. The coal, being small, lent itself to such treatment, and the resultant washed coal was fairly pure "brights" containing little but its inherent ash of less than 2%. The separation was as follows:—

TABLE 4

Constituents of Yorkshire Slack	%
Cleaned Coal	80.0
Refuse	11.0
Dust...	7.0
Water	2.0

The dust is saleable as powdered fuel, but difficulty is met with in disposing of the refuse, which naturally has a very high ash content. However, accepting this fraction as valueless, all the costs of the cleaning were covered by the extra value of the cleaned coal for gas-works use.

There are many benefits associated with coal in which the ash has been reduced to 2% or 3%. The capacity of all plant is increased and more products made per ton of coal. Also, the sulphur remaining in the coal is markedly reduced. The experience gained was very encouraging and a re-examination of the economics of this system, in the light of present prices, is needed, as the technical results were quite satisfactory. The improvement in appearance and size of the coke from the clean coal was remarkable, as was the reduction of ash in the coke, and, particularly, its regular distribution through the various sizes.

The screening test of coke from the South Yorkshire slack before and after cleaning are set out below:—

TABLE 5

Grade	Screen Size in.	Coke from Original Coal Yield %	Coke from Original Coal Ash %	Coke from Cleaned Coal Yield %	Coke from Cleaned Coal Ash %
1	over 2	38.3	7.9	57.2	3.2
2	2 to 1½	26.9	9.6	24.5	2.9
3	1½ to ½	19.9	16.2	10.8	3.2
Breeze	under ½	14.9	25.8	7.5	3.6
Unscreened Coke		100.0	12.8	100.0	3.1

The marked reduction in breeze formation is a great financial advantage. The cleaning of the coal is so important from the point of view of good coke production that differences of opinion as to whose duty it is to clean the coal are to be deplored. The view has been expressed by a colliery representative that it is uneconomic to install elaborate cleaning plant at a colliery to produce a grade of fuel required by only a fraction of its customers. On the other hand, the transportation of dirty coal to gas-works, to be cleaned there, is obviously wrong. The alternative might be a common cleaning plant for gas coals in the mining area; but this would defeat another important objective, that of preserving the characteristics of individual coals, *e.g.*, swelling properties, oxygen content, &c., regularity of which is so important to the gas engineer. Coal cleaned down to its inherent ash would be of almost incalculable benefit to gas-works, where not only would the coal gas making and coke production be assisted materially, but water gas manufacture and boilers would also benefit in efficiency as well as require less labour. If the ash in the coal were reduced by 5% the cost of all coal transportation would be reduced by that proportion, and practically all clinker troubles would disappear.

All these advantages would enable a substantial contribution to be made by gas-works towards the cost of extra cleaning, without affecting their balance-sheets, and an examination of the possibilities of coal cleaning down to the inherent ash of between 1% and 4% is advocated. It is also suggested that in view of the changes now going on in the mining industry this is an appropriate time to press for the introduction of adequate cleaning plant at those collieries from which gas-works are supplied. This claim is put forward on the grounds that, in the case of gas-works coal, such a step woud benefit practically the whole of the products—*viz.*, both gas and coke, which represent 90% of the original coal. It would also relieve the railways, fewer wagons being required for coal and clinker.

It is gratifying to note that the Gas Research Board adopted a recommendation of its Sub-Committee on Coke, that arrangements should be made, when possible, to evaluate the use of clean coal containing 2.5% to 3.5% ash by operating a selected gas-works for 12 months on a special supply of coal. It was felt that the selected works would have to be equipped with more than one type of carbonizing plant and with a water gas plant, but that it was unlikely that the work could be arranged during war time. The factors which were considered to require evaluation were:—

(1) The behaviour of the coal during carbonization.
(2) The properties of the coke.
(3) The value of the coke in relation to water gas production, and domestic and industrial uses in general.

It is to be hoped that now the war is over no time will be lost in giving effect to these proposals.

The extent to which the coal is washed before delivery to the gas-works largely determines the method adopted in the preparation of the coke.

CARBONIZATION PROCESSES

Carbonizing Plant

The type of carbonizing plant has an important bearing on the characteristics of the coke produced, and the division is between "static" and "continuous." (See Table 2.) The former is represented by horizontal retorts and intermittent chambers, both of which tend to produce a relatively dense coke. In general the difference between "intermittent" and "horizontal" cokes is usually small, since coke from intermittent chambers, although carbonized under rather more pressure from the weight of coal in a chamber, derives some little advantage from the steaming. Time of carbonization is also a very important consideration, a long charging cycle being a great drawback in both systems. On the other hand, the movement in the continuous carbonization process keeps the coke lighter, and the higher steaming normally practised tends to reduce the thickness of the walls of the pores. This effect is usually emphasized by the use of low-rank coals which work so much better in continuous vertical retorts, owing to the fact that they swell less during carbonization.

Reactivity

Coke from continuous vertical retorts is usually the more reactive, and that produced from washed coals mined in the southern area of the South Yorkshire field is satisfactory from this point of view. Most other cokes would benefit by artificial activation.

Gas Production

It is rarely, if ever, that both coal and carbonizing plant can be selected solely to suit the quality of coke desired. Normally, it must be conceded that in selecting the coal for use in a gas-works, gas production demands first consideration; but at the same time it should be emphasized that the economics of gas making and coke production cannot be separated. One important question, therefore, is:—To what extent do the interests of gas and coke production coincide or clash? To this question there is, unfortunately, no clear-cut answer. It all depends on circumstances. Even under the most advantageous conditions, the economics of gas production must to some extent be handicapped, if the interests of the coke are to be fully served, and *vice versa*. The most obvious example of this is

probably in the carbonizing time allowed for the coal. By leaving the coal in the retort sufficiently long to drive off the last therm, and thus maintain the highest gas yield, the resultant coke is handicapped on two counts—*viz.*, its surface is more graphitic through prolonged heating, and the coke is very low in volatile matter. In a great many cases it is found that these interests are conflicting to a substantial extent. This is usually due to the type of plant already installed and to inability to secure regularly a suitable type of coal.

There is little doubt that at some works it is found impossible to reconcile the claims of gas and coke, and, as a consequence, gas is given priority; thus, a serious handicap is imposed on the coke. However, in deciding the class of coal to be carbonized it is always necessary to consider the class of coke it will produce, since coke production is unavoidable, and even a low return from coke is still the determining factor in the economics of gas production. An extreme case is, of course, cannel coal, which produces no saleable coke.

Before deciding the procedure to be adopted in the treatment of coke in the interests of the user, a variety of conditions must be reviewed. In order to assist in this, details are given of the significant features of two different coals, commonly used:—

TABLE 6

Coal	Gas Make	Coke Yield	Coke Density	Breeze Production	Coke Suited to
Durham Run-of-Mine	Good	Good	High	Low	Industrial Uses. C.W.G. Boilers.
Washed Derbyshire ...	Relatively Poor	Medium	Light	High	C.W.G. Open Fires.

In the event of being in a position to select the type of carbonizing plant best suited to coke production, choice would probably fall on continuous vertical retorts, in which the use of South Yorkshire and Derbyshire coals would ensure a coke of light bulk density.

Ash Content of Coke

The coke from any gas coal inevitably contains 50% more ash than does the coal from which it is made. The advantage of low-ash coal is, therefore, reflected and emphasized in the coke. Not only is the presence of ash objectionable, but the nature of the ash is far from constant. Some ash is less detrimental than others, by reason of its assisting to some extent the burning properties by catalytic action, and this is taken advantage of in artificial activation. Another variety possesses a serious drawback owing to the production of a "fluffy" ash which blankets the fire. The quantity of ash can, of course, be determined by test, but knowledge of the peculiarities referred to are largely a matter of experience. Schemes for separating ash from coke have been tried experimentally with very little success. Washers for recovering usable coke from clinkers are used but the flotation method is not satisfactory for saleable coke, one objection being to its appearance after treatment. High-tension electrostatic separators for ash in coal have achieved some success in America, but an essential factor of the process would appear to be smallness of particle size (less than 2 mm.). It is, therefore, not applicable to coke.

Coke Preparation

The aims of the process adopted are to regulate the moisture content of the coke; to remedy as far as possible the defects in the coal cleaning carried out at the colliery, and, thirdly to segregate the coke into the various sizes designed to assist its usefulness in the many fuel-consuming appliances. Circumstances vary only too widely from works to works, and it is of primary importance to examine the whole local situation to ascertain the applicability or otherwise of the methods available. Stock must be taken of the unalterable conditions as well as of those to which alternatives are possible. The first step in the active preparation is the removal of the coke from the retort, and cooling.

Quenching

Continuous vertical retorts offer facilities for the most advantageous form of quenching. The steam admitted for water gas making effects some appreciable amount of cooling before the coke reaches the extractor. The quantity of steam required for gas making limits the cooling at this point, and, in cases where this is insufficient, additional cooling is effected by water sprays in the coke chamber itself. In this method of cooling, practically all the heat is retained in the retort, and no apparatus is required for handling red-hot coke. It is calculated that by this means approximately 4 therms of heat are saved per ton of coal. This system does not always leave the coke sufficiently wet to prevent the dust nuisance, and it is sometimes necessary to provide additional water sprays for the coke after leaving the retorts, in order to allay this trouble. A moisture content of about 4% is necessary to do this.

Methods of dry cooling embodying a similar but less complete conservation of heat, and involving more trouble, are available for other types of retort. These, however, usually require the transportation of the hot coke in containers from the retorts to boiler settings. Such a system produces a completely dry coke in which the proportion of breeze is low owing to the coke not being shattered by water quenching. This lowered breeze content is advantageous, but against this there is the potential dust trouble. Some of the most reactive coke is cooled by this method; but in all probability its reactivity is due more to the origin of the coal than to the system of cooling. In addition, there are many types of water quenching, some of which do not deserve mention, because of the difficulty of preventing the coke being over-quenched by their use. Instances of water contents of over 20% are not infrequent. Two modern methods may be recommended, although neither conserves the heat in the hot coke discharged. Incidentally, attention is drawn to the fact that the heat removed from a retort setting by the hot coke is nearly 10 therms per ton of coal carbonized; and a scheme for its recovery is urgently needed. The two quenching systems are:—

(1) The cooling tower.
(2) The Le Fleuve conveyor.

Cooling Tower

The cooling-tower method applied to the intermittent chamber plant entails the coke being dropped from the chambers into a coke skip in which it is transported to the base of a cooling tower. Here it is quenched by approximately its own weight of water. The fall from the chamber and the sudden cooling both tend to fracture the coke; but the breakage is not serious in the case of coke from Durham coal, which is usually selected for carbonization in intermittent vertical chambers. After quenching, the coke is transported in the same skip by telpher line to a coke bench for cooling, where additional quenching can be carried out if necessary before elevating the coke to the screening plant.

The Le Fleuve Hot Coke Conveyor

The Le Fleuve conveyor is probably the most efficient method of handling, quenching and cooling the hot coke discharged from horizontal retorts. The only moving parts are contained in the pumps used for circulating the water, and, by having these in duplicate, one has for all practical purposes a duplicate conveyor. This system has the advantage of conveying and quenching the coke in one operation, and the power requirements are not excessive. About 12 h.p. is sufficient to drive the water-circulating pumps, though this obviously depends on the general lay-out and, in particular, the relative levels of the settling tanks and conveyor. The system also has the advantage of being extremely low in maintenance costs, and, if the water speed be regulated to 7 to 8 ft. per sec., little trouble need be expected so long as the length of the conveyor is proportioned to the size of the coke charge. There is an optimum length which controls the moisture content of the coke, but it is difficult to prevent substantial differences between the large and the small sizes. While the system is excellent as a coke conveyor and quencher, it does, however, suffer from the drawback that it is difficult to vary the moisture content of the coke once the plant is installed. In preparing the lay-out in the first place, therefore, great care is necessary to avoid too long a run of conveyor, which will result in over-quenching. On the other hand, too short a run will lead to under-quenching, with its resulting difficulties. It is impossible to ensure that each charge of coke has the same amount of travel and one can only strike an average which avoids over-quenching on the one hand and under-quenching on the other.

It has been found from experience over a number of years, that there is no difficulty in producing a particularly dry, large coke, but from the nature of the plant the moisture content increases as the size of the coke diminishes. Normally this range is rather wide, as the following typical figures show:—

TABLE 7

Size of Coke	Water %
No. 1 (Large)	2.0
No. 2	6.0
No. 3	15.0

If practicable, the remedy is to scalp the smaller sizes for works use and cut the large coke for the domestic market. The system very effectively separates the breeze, which although wet is not excessive in quantity.

COKE SCREENING

In addition to selection of the coal, careful attention must be given to separating into graded sizes all coke offered for sale. The use of unscreened coke is wasteful even where it is possible, and grading is of great practical importance. The necessity for some form of segregation has always been recognised. The earliest form of grading consisted simply of screening out the breeze, leaving "coke." From this screened coke "large coke" was forked by hand, leaving "broken coke." If the coal used has been properly washed at the colliery, the ordinary methods of screening without scalping are sufficient to give a satisfactory coke. The avoidance of scalping is to be recommended where possible as it has the advantage of reducing the breeze production, which in the friable cokes from Nottinghamshire and Derbyshire coal is always high.

It is not generally realized that screening can be used to perform two functions:—

(1) Simple separation into sizes.
(2) Some measure of control of the ash and moisture content of the coke for sale.

(To be continued)

Development of a Gas Grid*

By W. HODKINSON
General Manager, United Kingdom Gas Corporation, Ltd.
and
H. B. TAYLOR
General Manager, West Riding Group of Gas Companies

Concluded from p. 271

THE cost of constructing the present system was given in 1940, but we include in Table 2 the average all-in costs of 58.8 miles of main laid in 1938-39, together with the estimated present-day costs used in this Paper. The latter show an average increase of 135% over pre-war, a factor which will now render impracticable many schemes of integration which at that time would have been sound economic propositions. A sum of £2,000 has been included for the apparatus required at each station taking gas from the grid.

TABLE 2.—*Mainlaying Costs* 1938-39 *and* 1946

Bore (in.)	Cost per mile in £ Actual 1938-39	Estimated 1946
18	5,700	12,400
15	4,300	10,200
12	3,200	7,500
10	2,570	6,200
8	2,110	5,100
6	—	4,100
4	1,100	3,300

Interest and Sinking Fund Charges

These charges have been assumed at:

	%	%
(i) *Capital Structure*—		
One-third Ordinary Capital, maximum dividend	5.00	
One-third Preference Capital ...	4.25	
One-third Loan Capital	3.50	
Average Dividend and Interest Charge		4.25
(ii) *Sinking Fund*—		
3% over 20 years		3.72
Total Interest and Sinking Fund Charge		7.97

Cost of Compression

In 1940 the Authors gave costs of compression for various quantities of gas per day at pressures of from 5 to 35 lb. per sq. in., these costs including capital charges, metering, power and attendance, all based upon 1939 prices. The economies to be obtained using condensing/non-compounded and condensing/compounded compressors were also shown. For the purpose of this Paper these compression costs have been adjusted to 1946 prices, assuming steam at 2s. 6d. per 1,000 lb. to be used in non-condensing/non-compounded compressors.

In calculating the mains sizes upon which the present transmission costs are based it has been assumed that each manufacturing station will ultimately be compressing gas into the grid at an initial pressure of 30 lb. per sq. in. No attempt has been made to determine the economic combination of initial pressure and bore of main, as would have to be done in any complete investigation. It will be realized that any modifications on this account could only reduce the transmission costs given here. The conservative present-day compression costs used in this Paper are given in Table 3.

TABLE 3.—*Cost of Compression*

Development	Initial Pressure (lb. per sq. in.)	Cost of Compression (pence per 1,000 cu.ft.)
1944 loads	20	1.69
Potential loads	30	2.03
Average loads	25	1.84

TABLE 4.—*Operating Costs*

Development	1944 Loads (pence per 1,000 cu.ft.)	Potential Loads (pence per 1,000 cu.ft.)	Average Loads (pence per 1,000 cu.ft.)
Management and control...	0.28	0.22	0.25
Maintenance	0.52	0.27	0.39
Rates	0.45	0.45	0.45
Gas lost in transit...	0.72	0.72	0.72
Total	1.97	1.66	1.81

Operating Costs

These costs comprise management and control, maintenance, rates and gas lost in transit. The costs given in Table 4 are based upon experience in the daily operation of the existing system, and may be taken as conservative. Two points may be noted:

(1) *Rates.*—It is assumed that the distribution undertaking would be assessed for ratable value as a separate entity and upon the accepted " profits basis " applicable to public utilities.

(2) *Gas Lost in Transit* from the existing system for the year 1945 amounted to 4% of the total, 2.4% of which is due to the circumstance that gas is purchased under saturated conditions and sold only partially saturated.

Co-ordination of Production by Gas Grids

The size of a works is not in itself a measure of technical and economic efficiency; indeed, one can find many examples where small units are operating at higher efficiency than some of the large units of theoretically economic size. It is, however, now generally conceded that there is a case for the concentration of production into larger units wherever possible, having regard to the following factors:—

(1) Output per unit of labour.
(2) Reduction in stand-by plant.
(3) Need for skilled and specialized technical control.
(4) Improvement of load factor by spreading the diversity of load.

These points were dealt with in detail in 1944, but it may be stated that the conditions ruling to-day, and likely to rule in the future, all tend to improve the case for co-ordination of gas manufacture. The Authors believe that nowhere is this more necessary than in the West Riding, where it is possible to base proposals upon coke ovens sited at collieries and central gas-works sited in areas of concentrated demand.

A coke oven unit can compare favourably with other types of gas-producing plant from the point of view of capital cost, labour requirements and, to some extent, flexibility. For the purpose of this Paper it is assumed that production plant sited at collieries would be owned by the colliery undertaking, and that the distribution undertaking would contract to purchase supplies in bulk at an agreed price. The price for this gas must ultimately be the subject of negotiation as between a willing buyer and a willing seller, but we believe that such prices should be related to the costs of production in central works of equivalent size, with suitable corrections for transmission to the point of demand.

A grid undertaking as visualized in this Paper would only be attracted to coke oven gas from colliery-owned units should the price show advantage over that at which it could produce gas itself in similar plant with suitable corrections. On the basis of prices at present ruling, the attractive figure may be computed as follows:—

	Pence (per 1,000 cu.ft.)
Cost of producing purified gas in coke ovens at a gas-works site	13.27
Add Compression charges	1.84
Cost of gas purified and compressed	15.11
Less Transmission costs from a unit operated at a colliery site...	1.83
Equivalent value of coke oven gas from a colliery site	13.28

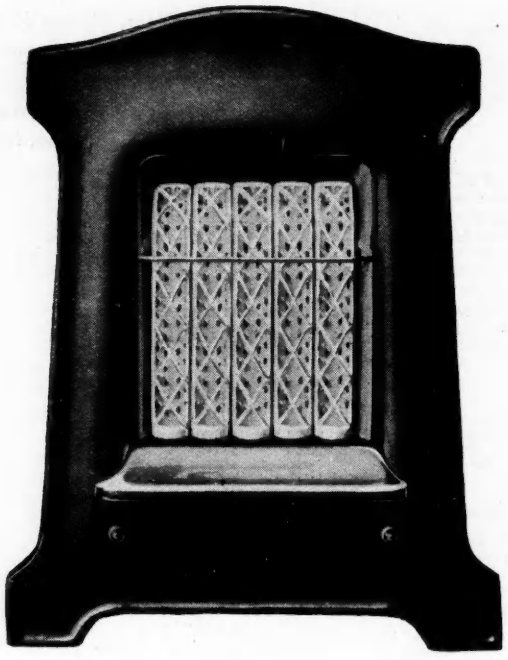
or, say, 12.5d. per 1,000 cu.ft. of gas purified and compressed into the grid system, a margin of 0.78d. per 1,000 cu.ft. as attraction to the grid undertaking.

Production Plant at Gas-works Sites

Assuming centralization of production at strategic points, the selection of plant will depend largely upon such factors as type of coke market, available coals, and degree of flexibility required. For the purpose of this Paper we have assumed that only 22.5% of the demand will be met by plant at colliery sites, and that the balance will be made available from production units of suitable type, spaced about the grid area at points of maximum demand. For large units above 10 to 14 mill. cu.ft. a day coke ovens have obvious attractions, but, in considering their application to the needs of the Industry, regard must be paid to (*a*) the quantity of salable coke produced per unit volume of gas made available for sale, and (*b*) the type of coke produced and its suitability for the markets in which the Industry is interested.

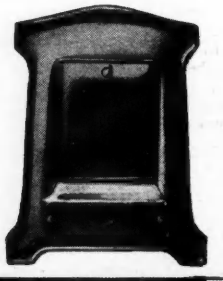
Working results from a unit of coke ovens compared with a unit of intermittent vertical-chamber ovens of a similar gas-production capacity shows that the salable coke ratio is 66.14 tons per mill. cu.ft. of salable gas, in the case of coke ovens, and only 37.54 tons in the case of the normal gas-works unit. It is obvious that the degree to which the Gas Industry should transfer its production to coke oven units is dependent upon opinion as to the future of the coke market.

* From Communication No. 298 of the Institution of Gas Engineers.



Solve their heating problem

by providing your consumers with the MAINSCREEN, the pressed-steel fire which, in these days of cast iron scarcity, fulfils the purpose of the heavier type without building in. It sits in front of the existing coal grate with its flue outlet under the canopy so that the products of combustion can be ventilated into the chimney. The MAINSCREEN fire is available in Black or in Coloured Paint finishes.

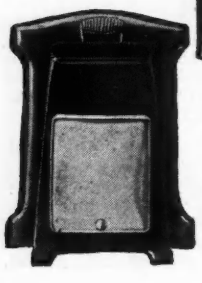


Front view, showing the loose Panel in position to cover up and protect the radiants when the fire is not in use.

MAIN

MAINSCREEN

Gas-Fire



Back view, showing where the loose Panel is stored when the fire is in use. The carrying handle can be seen above the flue opening.

R. & A. MAIN LTD. LONDON AND FALKIRK

We have previously stated our belief in the future of this market, providing due attention is paid to the preparation of the coke fuel and to adequate consumer service and market research. It is perhaps not generally realized that, with the Industry's present ratio of coke: gas production, a relatively small success in the development of the domestic coke market would result in a scarcity of the product.

The quality of coke produced in ovens is dependent upon two factors: (*a*) type of coal, and (*b*) speed of carbonization. From recent detailed investigations, it is apparent that, given the correct combination of these two points, it is possible to produce in coke ovens a fuel eminently suited to the domestic market.

Cost of Gas in Centralized Production Units

To examine the economics of centralized production with bulk transmission through a grid system, it has been assumed that the grid undertaking will purchase supplies in bulk from coke ovens operated by colliery undertakings situated at Upton, Hemsworth, New Monkton, Crigglestone, Thornhill, and Glasshoughton. Expanded production from the Upton site will entail the provision of a new transmission main from the site to the point of demand on the existing grid system, and, therefore, it is assumed that the coke oven gas price will carry the costs of this main.

To meet a maximum gas demand upon the extended grid of 155 mill. cu.ft. a day the Authors have assumed the following type and proportion of plant:—

	Mill. cu.ft. a day
Gas produced in coke ovens at colliery sites ...	35
Gas produced in coke ovens at gas-works sites...	60
Gas produced in usual types of gas-works plant at gas-works sites	60
Total	155

Such an allocation of plant would result in a coke production ratio of approximately 50 tons of saleable coke per mill. cu.ft. of saleable gas, a figure which is considered quite reasonable for this area. On the basis of this allocation, the average cost of gas at the point of production, and exclusive of cost of compression, would be as follow:—

Gas purchased from—	Quantity (mill. cu.ft. a day)	Price (pence per 1,000 cu.ft.)
(1) Colliery-owned units	35	10.66
(2) Gas-works operating coke ovens ...	60	13.27
(3) Gas-works operating normal gas-works plant...	60	20.18
Average price to be paid for all gas bought at works		15.35
Add Cost of gas transmission main from Upton to the point of supply —1.83d. per 1,000 cu.ft. on Upton input		0.17
Total cost of gas at works ...		15.52

It is assumed that the grid undertaking would purchase the whole of the gas produced at each of the manufacturing stations, and sell back to those undertakings, which operate plant on its behalf, such gas as they require for their own undertakings at prices identical to non-manufacturing undertakings.

The Authors in 1944 discussed methods of charge on a tariff basis for gas sold in bulk from grid undertakings, and it is assumed that some similar basis would apply in the scheme dealt with in this Paper. For the purpose of examining the economics of the scheme, however, they have taken average charges throughout.

Further Development of West Yorkshire Grid

With regard to projected developments, the Authors have assumed the retention and reconstruction of the existing coke oven plants at Thornhill, Crigglestone, New Monkton, and Glasshoughton. The plant at Hemsworth is new and, had it been possible to obtain permission to proceed, a large battery, designed primarily for the production of gas, would have been under construction at Upton. We have every reason to believe that this plant will yet be erected, when we estimate that there will be approximately 35 mill. cu.ft. a day from these coke oven plants, equivalent to 22½% of the estimated total requirements of the area.

Construction of a new gas manufacturing station is about to commence at Tingley, which will have an ultimate capacity of 16 mill. cu.ft. a day. In addition, the Authors indicate other plants located at Harrogate, Keighley, Bradford, Halifax, Leeds (2), and Huddersfield. They have assumed a total manufacturing capacity at these new works of 120 mill. cu.ft. a day.

The siting of these works, other than that at Tingley, is put forward for the purpose of this Paper only, but it is clearly desirable to develop plants at or about the centre of gravity of blocks of consumption approximately equal to the economic maximum capacity of one plant. In this way the cost of distribution of both gas and coke is minimized, and the exchange of peak load or emergency gas supplies is facilitated. Nevertheless, it is unlikely that many existing gas-works sites will be suitable for development as now suggested. The primary requirements of a suitable site must remain cheap handling facilities, followed closely by suitable sub-strata, road communications, water supplies, and labour facilities. It is suggested that somewhere adjacent to the centres indicated suitable sites could be found, and once more the Authors would emphasize the need of determining such sites before any grid is designed or constructed.

Having determined provisional routes for the mains; having arrived at the potential loads to be provided for; and having located possible production sites, it is then a simple matter to calculate the sizes of mains involved.

Stages 1 to 6 inclusive are now in operation, and the cumulative total transmission cost has been progressively reduced from 8.21d., 6.14d., and 6.83d. per 1,000 cu.ft. to 6.81d., 5.24d., and 5.73d. per 1,000 cu.ft. Final development for the purpose of United Kingdom Gas Corporation, Ltd., would involve stages 1 to 10 inclusive, when even including the rural stage 9, the total transmission cost will increase to only 7.19d., 5.45d., and 6.03d. per 1,000 cu.ft.

Stages 11 to 18 comprise further possible development to undertakings not controlled by United Kingdom Gas Corporation, Ltd., leading up to the complete regional grid. The cumulative total transmission cost varies with the addition of these other stages, terminating in a cost of 3.86d., 2.90d., and 3.22d., per 1,000 cu.ft. for the complete scheme.

Unity of Purpose

It will be apparent that these low transmission costs are only made possible by the collaboration of all undertakings involved in any particular stage of development. For example, stage 15, which enables six undertakings to be given a bulk supply and one undertaking to be developed as a major manufacturing station at a very low transmission cost, would be entirely uneconomic if only one or two of the undertakings desired a bulk supply. Here again the importance of planning to finality must be emphasized, and we would suggest that unity of purpose, and a measure of collaboration between undertakings within geographical groups, would go far to bring about the developments visualized in this Paper.

This does not mean that all the undertakings involved in any stage would be given a bulk supply simultaneously. Clearly regard must be had to the condition of existing manufacturing plants and to the present availability of bulk supplies of gas. For example, the mains provided in stage 15 would meet the present requirements of all the undertakings included in that stage with gas supplied from Bradford. Thus a large manufacturing plant could be initially built at Bradford, supplying gas in bulk to these undertakings, when, as both the local demand in Bradford and the demand from these undertakings increased, the new central plant suggested at Keighley could be built up section by section, gradually taking up the load of these undertakings, until finally the Bradford plant would be devoted solely to their local requirements, the Keighley plant supplying the remainder.

Exactly the same considerations apply in the case of section 14. Here the mains suggested would enable all the undertakings, with th exception of Halifax, to be supplied initially with gas from the new plant at Tingley. As the loads developed the new manufacturing plant at Halifax would be built up stage by stage, until, ultimately, this plant would meet the requirements of all the undertakings on this section.

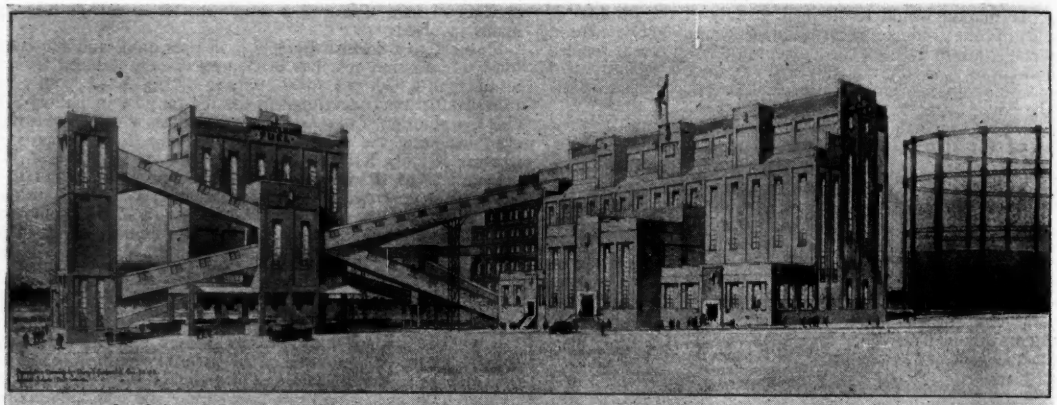
The value of the interconnecting link between each section and the main grid or neighbouring sections, will be appreciated. Development will not occur simultaneously in each section, and the output from any large plant will be economically increased only in large steps of perhaps 5 mill. cu.ft. a day. The connecting links will enable the timing of these extensions to be greatly facilitated, and will obviously reduce the amount of surplus plant normally carried during a period of increasing outputs. Furthermore, no works is immune from occasional troubles. The interconnecting links will provide a margin of reserve capacity from other neighbouring manufacturing units which will greatly reduce the capacity of the peak load, or mergency plant, which would otherwise have to be carried at each works

The inclusion of manufacturing stations' loads in the averaging of transmission costs can be more than counterbalanced by the advantages to be obtained, by these larger undertakings, in the averaging of manufacturing costs in coke ovens and gas-works plant. The cost of manufacturing gas in large-scale gas-works plant has been estimated above at 20.18d. per 1,000 cu.ft., whereas, with complete development, the manufacturing works would be able to buy back from the grid at 19.38d., 18.42d., and 18.74d. per 1,000 cu.ft., *i.e.*, 0.80d., 1.76d., and 1.42d. per 1,000 cu.ft. less than their cost of manufacture.

Scope for Bulk Distribution

The Authors believe that the costs given in this Paper will clearly demonstrate the great scope for bulk distribution of gas in an industrial area such as the West Riding, provided that the area can be considered as a whole. The primary factor on which any scheme must be judged is its effect upon the weighted average cost of gas into holder in the area under consideration; only if this cost can be reduced could a scheme be justified.

Given this reduction, there are many secondary advantages to be derived. The large, modern, manufacturing plants which would be developed as the scheme proceeded over a period of years would be designed for the manufacture of gas and coke for the domestic market, with all the improvements which modern technique can bring to bear when freed from restrictions imposed by considerations of existing plant. The works would be of a size sufficient to afford the provision



SALFORD GAS DEPARTMENT · · EGERTON STREET WORKS
PROPOSED NEW CARBONIZING PLANT · · WEST'S GAS IMPROVEMENT CO. LTD.

GLOVER-WEST

Vertical Retorts

Another example of the application of modern ideas in architecture to the principal buildings of the Gas Works is shown in this design of the carbonizing plant to be built at the Egerton Street Works of the Salford Gas Department.

WEST'S
GAS IMPROVEMENT CO., LTD.

Miles Platting, MANCHESTER 10
Telephone: Collyhurst 2961-2-3-4-5.
Telegrams: Stoker, Manchester.

London Office: Columbia House, Aldwych, W.C.2
Telephone: Holborn 4108-9.
Telegrams: WESGASCO, ESTRAND.

of adequate technical control, and their products would be of constant quality. Local managements, when divorced from all their many present manufacturing worries, would be able to concentrate on the distribution and utilization of gas and coke, and on improving the Industry's service to its consumers, work which requires, all the time, enthusiasm and drive that they and their staffs may have.

It is hoped that it will not be thought from this Paper that the advantages of bulk distribution of gas are confined to areas having "surplus" coke oven gas. It will be seen that, as the possible development of the West Riding area is envisaged, only some 22½% of coke oven gas from colliery sites is utilized. There remain many areas where consideration could usefully be given to these problems. The basic requirement of all such schemes must be the reduction of the weighted average cost into holder of the undertakings involved. In some cases there may be 100 undertakings which can economically be given bulk supplies; in another case only one undertaking.

In the Authors' experience it is quite impossible to generalize as to the distances over which it is economic to convey gas in bulk, and we would emphasize that each case needs detailed investigation. It follows that very great harm can be done to the Industry if hypothetical regional areas are established before the economic limits of bulk distribution are determined in respect of the various constituent parts of any region. The work entailed in considering the various blocks of gas undertakings scattered about the country which may, or may not, be geographically suitable for this type of integration is considerable.

The Authors are further of opinion that single ownership is not a necessity to achieve such measures of co-ordination. Co-operative planning and effort between undertakings could produce all the requirements for a scheme, thereby retaining the existing framework upon which to build for the future. They can see no signs of the problem being faced and tackled, and are forced to the alternative conclusions that the Industry does not appreciate the need; that the need is appreciated, but that the facilities are lacking; or that the Industry will allow its future to be settled, not by a reasoned examination of practical possibilities, but by a haphazard drawing of boundaries upon a map. If this Paper brings home the magnitude of the work entailed in arriving at a considered programme, the Authors will feel well rewarded.

The Authors express their thanks to Col. W. M. Carr, O.B.E., T.D., for the facilities and permission which have enabled them to present this Paper.

Expansion at Stoke-on-Trent

In his report for the year ended Mar. 31, Mr. J. E. Stanier, Chief Engineer and General Manager of the Stoke-on-Trent Gas Department, states that the year was one of increased activity in every section, culminating in record sales of gas and residual products. Gas delivered totalled 4,015,021,000 cu.ft., an increase of 7.87% over the previous year. In ten years the output of gas has more than doubled, notwithstanding the fact that industrial demands during the six years of war showed only a slight improvement. Domestic sales increased from 1,008,774,300 cu.ft. in 1939 to 1,487,248,700 cu.ft., which means in effect that each domestic consumer is now using on an average almost 50% more gas than in pre-war days.

Industrial consumption increased from 1,575,308,000 cu.ft. in 1939 to 1,832,779,700 cu.ft., and the Report says "the Department is only on the fringe of a tremendous industrial load, which will ultimately result from the modernization of the firing process in the ceramic industries." The undertaking faces a period of rapid expansion and heavy expenditure in order to keep step with the vast demands which will be made upon it.

The report reviews progress of the big extensions to the plant at Etruria, and says that the contractors are being pressed to complete the five million M.A.N. waterless gasholder in 22 months. If they are able to do so it should be ready for use early in 1948.

There was an increase of 8.65% in the number of tons of coal carbonized. To cope with the greatly increased throughput, the Department purchased 102,448 tons of fuel for carbonization, compared with 99,926 tons in the previous year, and reduced its stocks from 7,893 tons to 3,980 tons.

The decrease in the Department's coal stocks is most unsatisfactory, and greater deliveries will have to be forthcoming during the summer months to enable a reasonable reserve to be on hand in readiness for the heavy winter load. Production yields were well maintained during the year. The total quantity of crude benzole made was 319,840 gall., as against 304,480 gall. in the previous year.

The total volume of appliances sold through the various showrooms advanced substantially, and showed a net increase of £11,516 over last year, notwithstanding the fact that deliveries of all types of appliances were very restricted the quantity received being totally inadequate to meet the demands of consumers. Altogether a total of 850 cookers were supplied against 460 last year, but when this is compared with the 6,000 of 1939, it shows how much room there is for improvement in supplies.

Shortage of Spare Parts

One of the greatest difficulties experienced during the past year has been the supply of spare parts for existing appliances, particularly those on simple hire, of which 17,000 are in service. Very strong representations have been made to the Ministry of Fuel and Power and the British Gas Council, in order to secure some priority for the manufacture of these parts, but the final result has not been up to expectations. The most serious aspect of this position is that the replacements would go a long way to secure higher efficiency and a resultant saving in gas consumption.

Total expenditure during the year was £537,178—an increase of £71,951 on the previous year. The main contributory cause was higher coal costs.

Income from all sources amounted to £618,855—an increase of £67,177. Gross profit transferred to net revenue account for the year was £81,677, against £86,450, which after deducting redemption and interest charges, &c., resulted in a net profit transferred to reserve account of £19,961, as against £28,065.

Since the last increase in the scale of charges in 1942, one advance after another has had to be met on account of coal, materials and wages, whilst the cost of coke oven gas has increased since the last revision of gas charges. The higher expenditure which will have to be borne during the coming year appears likely to be of such magnitude that an amendment in the price of gas should have very careful consideration.

Briefly, the additional expenditure for the coming year will be as follows:—(1) Introduction of six-shift system, sickness benefits, increased rates of wages and salaries, £11,000; (2) estimated war damage contributions for the year 1946-47, £12,400; (3) increased interest and redemption charges on new plant, £3,500; (4) renewal of four settings in No. 1 vertical retort house (50% of £20,900), £10,450; total, £37,350.

In their report to the Council, the Gas Committee stated that, arising out of the annual accounts and report, they had carefully considered a suggested new scale of charges for gas supply. They recommend that with the approval of the Ministry of Fuel and Power a new scale be put into operation from Sept. 30. This proposed scale is of increased charges for consumers of over 20,000 cu.ft. per quarter.

Carlton Urban District Council is to draw the attention of the Nottingham Gas Committee to the report that a large sum of money had been handed over for the benefit of Nottingham ratepayers, and as Carlton and other adjacent areas are large contributors to the profits to inquire whether some reduction in charges should not be passed on to local consumers.

High Altitude Rock Drilling has been the particular study of Mr. J. E. Spense, who has recently carried out some interesting experiments in South America. Using a Warsop rock drill he obtained good results at a height of 16,000 ft., drilling a 30 cm. hole in 3.5 minutes. The engine speed was estimated at 1,800/2,000 r.p.m. and Mr. Spense reports completely satisfactory starting and operation.

The price of gas at Glasgow is to be raised by 3d. per 1,000 cu.ft., which will bring the charge to the domestic consumer up to 4s. 1d. per 1,000 cu.ft. subject to the permission of the Ministry of Fuel and Power. The increase has been made necessary, according to Convener Elger, by the rise in production costs due to increased wages and the price of coal. While there had been an increase in coal prices since 1939 of 120%, the increase in gas charges in the city over the period was equivalent to only 36%.

Councillor Elger estimated that the increase now proposed would not add more than 5s. to the annual costs of the average household. He mentioned that in the past year over £1,000,000 had been collected from prepayment meters. This was the largest amount ever collected in a year from these meters, and he understood it was due largely to the use of gas for heating owing to the scarcity of coal.

New and larger premises have been acquired by the North British Rubber Company, Ltd., for their North Eastern Branch at 181-185, Morrison Street, Edinburgh. The new Manager of the Branch is Mr. W. Campbell, who has had considerable experience on the sales side in Scotland. A change has also been necessary in Manchester, where the position of Manager has been vacant for some time. Mr. A. Broady, of the Sales Staff there, has been appointed Manager, and he will be supported on the sales side by Mr. Parker (footwear, Manchester and Liverpool districts), Mr. Tomlinson (general goods, Manchester district), and Mr. Wilson (general goods, Manchester district; sports goods, Manchester and Liverpool districts). A change in the Glasgow area is also notified. Mr. J. W. Begbie, who has been Manager there for the last 30 years and has had 43 years of continuous service with the Company, retired at the end of last month. He is being succeeded by his assistant, Mr. J. McElroy.